

Transformation of Value Chain Governance: The Impact of Food Safety Regime on Fishery Sector of Kerala[§]

Jayasekhar Somasekharan^{a*}, K.N. Harilal^a and Sajan Thomas^b

^aCentre for Development Studies, Thiruvananthapuram, Kerala

^bUniversity of Bergen, Norway

Abstract

Considering the theoretical aspects of Global Value Chain, this study has attempted to empirically validate the concepts by taking up a case study of Kerala in India. While examining the evolution of value chain dynamics, the study has found that different types of coordinations have governed the seafood export chain of Kerala from 1950s onwards. The evolution of Kerala's seafood industry from mid-1950s to late-1960s provides a good example of how a captive form of coordination can evolve towards the inter-firm governance structure. From early-1970s, the value chain governance structure shifted from the captive form to more or less a modular one. The vertical disintegration and division of labour have been observed to be the striking features of the sector from 1970s onwards. Subsequently, a large number of new entrants were attracted to the business until the mid-1990s. In the recent international food safety regulatory regime, the seafood value chain has been completely transformed. Concentration and consolidation are taking place at the processing node of the chain, wherein the number of exporters has come down and professional players are upgrading their positions in the value chain. The pre-processing node of the chain is getting integrated to the processing sector, causing a major transformation of the existing value chain. The study has categorically proved that the international food policies can restructure the entire fish commodity chain of a developing country.

Key words: Value chain governance, food safety standards, fishery exports, Kerala

JEL Classification: D46, F14, N55, Q22

Introduction

The proliferation and increased stringency of food safety and health standards is a major concern among many developing countries, because these countries either lack the technical and administrative capacities needed for the compliance, or these standards can be applied in a discriminatory or protectionist manner. Therefore, it is important to understand the impact of such standards on various agricultural export sectors

in the developing countries. Marine products have long been the most buoyant among Indian export lines. The demand for stringent hygienic standards in the production and processing facilities greatly increased after the stipulation of Hazard Analysis Critical Control Point (HACCP) by the United States Food and Drug Administration (USFDA) and the European Community (EC) directives (especially EC91/4937). The Government of India responded to these developments by taking important steps to maintaining high quality standards in accordance with the safety regulation requirements of the importing countries. The Seafood Exporters Association of India (SEAI) also spent US\$25 million on upgradation of the processing facilities so as to meet the food safety regulations of

* Author for correspondence
Email: jaycperi@gmail.com

§ The research paper is an excerpt from the doctoral dissertation of the first author conducted at Centre for Development Studies, Thiruvananthapuram.

the importing countries. The resultant impact on the structure of supply chains had significant economic and social consequences to the marine fisheries sector of the country.

In the present study, we put forth the hypothesis that evolving stringent food safety standards imposed by the developed countries will have a ripple effect along the entire supply chain originating from a developing country, which may transform the seafood value chain. The study has covered the entire seafood value chain (including the up-country market) using the theoretical framework of Global Value Chain¹. The main objectives of the study are to find the evolution and changes in the Kerala's sea food value chain governance over various time periods, and to analyse the influence of food safety standards on governance structure of the value chain. The study has analysed the structure and characteristics at each node of the value chain, to find what kind of activities and functions are performed, how these activities and functions are carried out, how do the food safety regulations modify them, who are the actors involved, and how does the value added is distributed along the value chain.

Tracing Global Value Chain Methodology

The analytical register of the commodity chain concept was reoriented by Gereffi (1994), who developed a framework for the study of Global Commodity Chains (GCC). He viewed these chains as an emergent property of economic globalization. One of the central contentions of the GCC approach is that the internationalization of production is becoming increasingly integrated into a globalized coordination system that can be characterized as 'producer driven' and 'buyer driven' commodity chains (Gereffi, 1996). The paradigm shift in the GVC methodology was provided by Timothy Sturgeon in his work on contract manufacturing in electronics, that argues, value chain modularity represents a mode of industrial organization that is not only neither market nor hierarchy but more accurately could be described as networks (Sturgeon, 2002). In continuation, Gereffi, Humphrey and Sturgeon were able to redefine the theory of GVC

governance, wherein they specify a particular relationship between a set of independent variables (industry-specific characteristics of the value chain) and the dependent variable (governance structure).

The resulted theory views the governance form varying systematically according to the three independent variables: (1) complexity of information and knowledge required for transaction, (2) codification and efficient transmission of the information between actors, and (3) existing capacity in relation to the requirement of transaction (Gereffi *et al.*, 2005). This leads to five possible categories of governance structure. 'Market relations' are dominant when transactions are easily codified. 'Modular' value chains arise when the ability to codify specifications extends to complex products and when suppliers have the capacity to use generic manufacturing competencies to supply full packages and modules. 'Relational' value chains arise when product specifications can not be easily codified, products are complex and supplier capabilities are high, which leads to frequent communication and subsequently mutual dependence between actors. 'Captive' value chains arise when the capability of suppliers is low, which leads to a higher degree of monitoring and intervention by the buyer and to a transactional dependence of supplier to buyer. 'Hierarchy' occurs when product specifications cannot be codified, products are complex and competent suppliers are not available. In this framework when value chain moves from 'market' to 'hierarchy', the level of explicit coordination increases and with it, power asymmetry between actors. In focussing on this type of coordination, the GVC governance theory brackets the broader institutional and regulatory environments in which global value chain operates.

An array of empirical validation of GVC methodologies evolved in the previous decade, wherein most of the studies underscored the buyer drivenness of value chains originating from the developing countries. In this context, it is worthwhile to mention the works on Indo-UK cashew value chain by Harilal *et al.* (2006); analysis of selected agro-foods value chains (citrus, cotton, coffee, and chocolates) from

¹ Global value chains (GVC) refer to a set of intra-sectoral linkages between firms and other actors through which the geographical and organizational reconfiguration of global production is taking place. The GVC analysis highlights the concrete practices and organizational forms through which a specific division of labour between lead firms and the other economic agents involved in the conceptualization, production and distribution of goods in global industries is established and managed (Gereffi, 1996).

Africa (Fold and Larson, 2008; Gibbon and Ponte, 2005); detrimental impact of international coffee agreement regime on developing country exporters (Ponte, 2002); Chilean salmon value chain (Phyne and Mansilla, 2003); and dominance of vertical coordination in global agricultural value chains (Humphrey, 2006; Roedel *et al.*, 2003). All these studies have concluded that the lead firms are to seek tighter forms of coordination with the actors upstream, sometimes even vertical integration, and relatively looser form of immediate coordination may coexist with this high level of drivenness.

Data and Methodology

The present study has visualised the seafood export chain through global value chain theoretical frame. It has examined the forms of coordination in the seafood export value chain of Kerala, ever since it started to evolve, and the role of different institutional frames in governing it. Apart from examining the macro level chain governance, it has also focussed on the micro level coordinations at the various nodes of the chain. It has adopted the analytical frame developed by Gereffi *et al.* (2005), wherein they have illustrated five different possibilities of coordination (market, modular, relational, captive and hierarchy).

As far as the value chain structure in the recent food safety regulatory regime, the insights obtained from the field study conducted in Ernakulam and Alapuzha districts of Kerala were utilized. During the field survey, 47 processing units and 32 pre-processing centres were covered and information was also collected through informal discussions with stakeholders of the seafood export sector. The snowball sampling technique was adopted to select the key informants of the value chain. Commission agents of the European importers were especially helpful in providing detailed information about the downstream end of the chain. They also provided the contact details of importers whom they were dealing. Twenty-two importers responded positively to our queries and the information provided by them on downstream markets was very crucial in our analysis.

Results and Discussion

Kerala's Seafood Industry from 1950s to late-1960s: Dominance of Captive Value Chain

The evolution of Kerala's seafood industry from mid-1950s to late-1960s is a typical example of emergence of a captive form of coordination towards the inter-firm governance structure. The viability of the seafood export sector was very well established by the end of 1950s, and from the early-1960s onwards the number of export firms increased at a rapid pace (Table 1). The growing demand for the product in the international market and the perceived future potential of exports attracted new entrants to the sector (Shajahan, 1987).

Table 1. No. of exporters in Kerala and market share of USA and Japan in percentage of export value (1957-1970)

Year	No. of exporters	Market share in percentage	
		USA	Japan
1957	4	100	-
1962	8	92	3
1966	27	78	14
1970	53	47	30

Source: Compiled from MPEDA registers, registration section

The proportion of partially integrated and non-integrated firms increased towards the latter half of the 1960s was largely due to the steady growth in production and freezing capacity in the industry. The USA was the major market destination and the importers from USA helped the emerging industry in Kerala with technical support and financial facilitation.

The system of trade in the seafood export sector of Kerala during the 1960s was known as 'consignment system of sale'², which is the typical contractual arrangement between exporters of India and the buyers of USA. Since this was a long-term contractual arrangement, continuous supply of the raw material was guaranteed and there existed a strong bilateral

² In this system of sale, exporters from India were given open orders without mentioning the required quantity and upto the 80 per cent of the value of the raw material (including the margin) was provided as advance at the time of shipment of the produce. For the remaining amount, the exporters had to wait until the produce was sold in the export market (Mathew, 1986).

Table 2. Total number and characteristics of seafood exporters of Kerala (1961-1971)

Year	Integrated	Partially/not integrated	Total
1961	6 (86)	1 (14)	7
1963	5 (38)	8 (62)	13
1965	4 (19)	17 (81)	21
1967	4 (13)	28 (88)	32
1969	3 (7)	41 (93)	44
1971	2 (4)	55 (96)	57

Source: Compiled from MPEDA registers, registration section

Note: Figures within parentheses are percentage values

relation between the importer and exporter. The Indian exporters were updated by the American trade partners on the latest market trends, price signals, technical knowledge, suggestions for quality improvement and the packing systems (MPEDA, 1982).

During 1960s, the seafood chain from Kerala had a captive form of coordination from the US buyers, wherein the US buyers had the ability to codify the highly complex product specifications in the form of detailed instructions. On the other hand, Kerala's seafood industry was in the emerging stage with low supplier capabilities, and thereby the value chain governance shaped as captive type. At the upstream end of the chain, we could identify vertical integration of the firms during the early-1960s (Table 2). It was inevitable for the firms to own fishing fleets and pre-processing facilities because during that period there was a negligible autonomous expansion of the trawler fleet by fishermen themselves and hence, it was essential that these firms invest in boats to augment production and exports.

Seafood Industry of Kerala, 1970s to early-1990s: Transformation from Captive to Modular Value Chains

From the early-1970s onwards the governance structure of Kerala seafood industry highlights the dynamic and overlapping nature of the global value chains. The increasing capabilities of the supplier had helped them to shape the architecture of value chain

from captive network to modular network. During post-1970s, the consignment system of sale was replaced with the outright sales³, wherein Japan, who had become a major trading partner by then, preferred this system of sale and paid a better unit price than the USA. Moreover, with the liberal credit policy from 1971 onwards, the dependence of Indian exporters on American buyers reduced considerably. In the 1970s, increasing support was provided by the state in the forms of loans and subsidies for setting up freezing plants and purchasing of trawlers. More importantly, the credit policy of the commercial banks was liberalized *vis-a-vis* the seafood export sector. The enhanced prawn production and the phenomenal growth of the value of output in an environment of government support, promoted the entry of a large number of firms in the seafood export sector. The number of firms reached 224 in 1982 from 53 in 1970 (MPEDA, 1982).

The shrimp production, which was peeking at 85,000 tonnes during 1973 declined to 27,000 tonnes in 1982. The raw material scarcity coupled with the entry of a large number of exporters intensified the competition in the processing node. During the period 1975 to 1983, the top 10 per cent export firms increased their share from 38 to 53 per cent. The increased concentration was mainly due to the competitive edge of large established firms with regard to procurement, ability to get export orders, and their command over processing capacity. The multi-national companies (MNCs) entered the frozen prawn industry in the early-1970s, and it became a threat to the already established large exporters due to the aggressive procurement strategy of MNCs through their all India procurement networks. The MNCs also adopted indirect procurement through small processing firms with dormant processing capacity, to which they offered interest-free loans and commissions. In turn, the small processors started to compete with the already established large exporters. Consequently, the established firms found it difficult to compete with the MNCs. Perceiving the threat to their monopoly, they made representations to the Government of India through MPEDA to curb the activities of MNCs in frozen prawn industry. As a result, the Ministry of Commerce, appointed a committee in 1975 to look into

³A system of sale where full amount of the negotiated price is paid by means of a letter of credit.

this matter (MPEDA, 1977). As per the recommendations of the committee, the government tightened the export policy against the MNCs and consequently, almost all MNCs left the seafood industry by late-1970s (Kurien, 1995; 1978).

After that, a group of large established exporters of Kerala emerged as highly influential and powerful actors in the processing node of the upstream seafood value chain. The period also witnessed the evolution of more disaggregated production and processing of shrimp at the upstream end, with the emergence of independent pre-processors in the seafood industry. The period from mid-1980s through early-1990s witnessed an intense competition across the firms in the face of declining prawn production, resulting in the exit of a large number of firms from the industry by the mid-

1980s. The strongest firms enjoyed the control over fresh prawn procurement and the credibility with the foreign buyers.

Seafood Value Chain during Food Safety Regime

This section looks into the present seafood value chain of Kerala in the context of food safety regulations. To avoid any ambiguity regarding value chain process, the shrimp export chain has been analysed exclusively (shrimp is the major export item which contributes the highest value share of seafood exports from India).

Distribution of Value-addition along the Chain

Table 3 provides information on the prices paid at key transaction points along the chain, and the price

Table 3. Revenue distribution along the seafood chain

Value chain node	Transaction activities	Price (US\$/kg)	Value share (%)*
Landing site	Price paid to the fisherman/boat owner	4.15	23.35
Auction agent	Price paid by peeling shed owner/agent	4.33	24.35
Peeling shed	Price paid by exporter / agent (A)	4.61	25.93
Exporter	a) Conversion cost	0.28	1.55
	b) Overhead cost	0.41	2.31
	c) Total cost of production (B)	0.69	3.86
	Selling expenditure		
	a) Packing charges	0.10	0.54
	b) Freight charges	0.29	1.66
	c) Interest on working capital	0.17	0.93
	d) Interest on term loan	0.02	0.09
	e) Other selling expenses	0.12	0.65
	Total selling expenditure (C)	0.69	3.87
	Total cost of export (B+C)	1.37	7.73
	Exporters margin D-(A+B+C)	0.76	4.30
Importer/agent	Price paid to the exporter (D)	6.75	37.96
	Cold chain transport and other expenses (E)	0.66	3.72
	Importer/Importers agent's margin F-(D+E)	1.14	6.41
Wholesale importer	Price paid to the importing agent (F)	8.55	48.10
	Value addition (G)	0.95	5.33
	Importer re-processors margin H-(F+G)	2.07	11.65
Supermarkets	Price paid to the importer-processor (H)	11.56	65.08
	Value addition and branding (I)	1.78	9.99
	Supermarket's margin J-(H+I)	4.43	24.93
Consumer	Price paid at the retail outlet (J)	17.77	100.00

*Price as proportion of retail price (%)

level as a proportion of the retail price as shrimp moves from catch to consumption. The landing site price for shrimp is about 23 per cent of the final retail price, which increased to 38 per cent of the retail price at the export point. Among the actors operating in the chain, the largest value-addition is made by the supermarket chain in shrimp. It has been observed that the margin realised by the actors keeps on escalating as one moves downstream of the value chain. More value addition and more profit realization of the supermarkets clearly reflect the power they could exert in the chain.

Forms of Coordination along Different Nodes of Value Chain

At the upstream end of the seafood value chain, captive coordination was observed between the boat owners/fishermen and the auctioneer which was very

much linked with the informal credit provisions provided by the auctioneer (Figure 1). Market form of coordination was predominant between the auctioneer and the exporter's agent (as well as independent agents), wherein the product was sold to the highest bidder. The independent agents would sell the product to processing units (export firms) or to the pre-processing units (peeling sheds) and the market form of coordination is reflected in these nodes. The peeling units after minimal processing, supply the product to the export houses, and besides market coordination there exists a relational coordination, especially between peeling sheds and export houses. The export houses provide financial support for upgrading these peeling sheds and in turn a relational form of coordination is evolved in this node. Modular coordination coexists along with the market

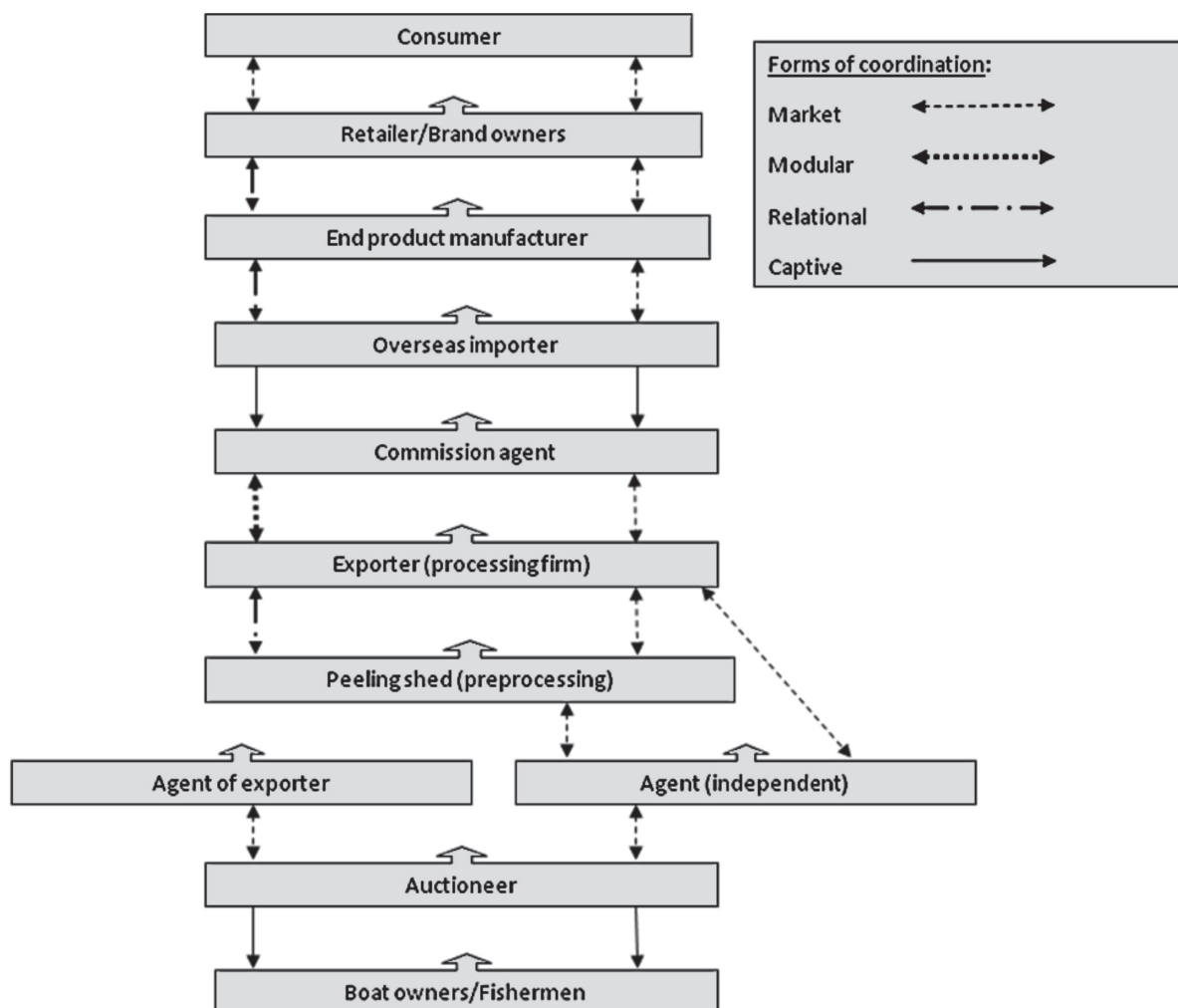


Figure 1. Forms of coordination in the seafood value chain

coordination between exporters and export agents. In fact, the exporters mainly bear the risk of consignment rejection and due to the dependency of exporters on the EU importers, a captive form of coordination evolves between Indian exporters and EU importers.

Within the European segment, two types of coordination coexists (market and relational) in all the nodes. Since in the European segment the actors have perfect information on product specifications and also have access to the product segmentation and final markets, it becomes a common responsibility for them and thereby it is characterized by the relational coordination between them. On the other hand, since the complexity of the information is low and switch over cost is meager, market form of coordination also exists in the downstream segment. Therefore, multiple forms of coordinations govern various internodes of the Kerala's seafood export value chain. However, in terms of the whole-chain governance, the seafood chain of Kerala is indubitably governed by the overseas buyers and thereby is dominated by the captive form of coordination.

Governance Structure of Seafood Value Chain: Changing Power Relations

In the upstream processing node of Kerala's seafood export value chain, it is found that the institutional support of the state machinery was fairly positive in addressing the changes in the regulatory scenario in major export markets. Faced with restrictions on exports of fish and fishery products to the EU in 1997, the authorities responded rapidly with the imposition of quite onerous requirements that were designed to demonstrate that it was to comply by the end of 1997. Similarly, when residues of antibiotics and bacterial inhibitors were detected in shrimp by the EU authorities in 2002, the state was quick in imposing strict controls on antibiotic use. These actions imposed considerable costs on the processing sector (Henson and Jaffee, 2008). At the same time, these controls were undoubtedly critical in maintaining market access and in preventing additional restrictions from being imposed.

Recognizing the potential impact on the fish processing sector and the constraints that it faced in achieving compliance, the Indian government differentiated the standards that exporters were to meet

in supplying fish to the EU and other overseas markets. Exporters to non-EU markets were granted a longer time to integrate pre-processing operations and to source from approved independent pre-processors. This pragmatic strategy focussed attention on maintaining access to the EU markets while sustaining pressure for upgrading of standards across the processing sector as a whole and to enable effective responses to the emerging quality related issues. Significant investments have also been made in inspection and laboratory testing capacity.

The sector has witnessed a paradigm shift regarding the way it was functioning. Marine Products Export Development Authority (MPEDA) and Export Inspection Agency (EIA), Cochin, are the institutions which are the major actors of the horizontal segment of the processing node of Kerala's seafood value chain. Alongside regulatory measures, the MPEDA has implemented programmes to support improvements in hygienic controls and other food safety practices in fish processing.

Based on the field study, the average compliance cost across the seafood processing firms was estimated to be US\$ 0.40 million, which is at least a modest indicator of the investment cost spending per processing unit for maintaining market access to the EU. The changes required to comply with the hygiene requirements varied significantly among fish processing plants. In extreme cases, the entire layout of the plants had to be changed. According to the majority of the exporters, the integrated pre-processing facility was the major item among the compliance cost components. In fact, the integrated pre-processing facility is a mandatory requirement according to the Export Inspection Council of India (EIC).

It was observed that some export units carried out the necessary adjustment for compliance proactively, anticipating the need to operate to stricter hygiene standards and building such considerations into the design and operation of new or upgraded facilities. It is widely recognized in the fish processing sector that for smaller exporters, two or three consignment rejections can close a unit. Therefore, many processors have made efforts to spread their risks by diversifying their market base between the European Union, United States, and Japan. Some have diverted sales to less challenging markets such as China, the Middle East, and Singapore.

Table 4. Change in concentration of seafood firms in Kerala

Year	Number of firms	Industry (US\$ million)	Turnover/firm (US\$ million)
2002-03	216	215	1.00
2003-04	178	243	1.37
2004-05	161	257	1.60
2005-06	146	285	1.95
2006-07	140	339	2.42
2007-08	138	360	2.61
2008-09	132	396	3.00

Source: Compiled from MPEDA registers, registration section

Despite upgradation of facilities and procedures, both EIA and MPEDA have been unable to perform all of the tests for residues and contaminants required, especially for exports to the EU. In fact, they are caught up in a seemingly continuous process of equipment upgrades and staff training to keep on the top of emerging issues. Keeping up with current requirements is an issue, particularly for contaminants for which the limit is set at the Limit of Determination (LOD)⁴.

It was observed that in Kerala, concentration and consolidation are taking place at the processing node of the seafood export chain wherein the number of exporters has come down and professional players are upgrading their position in the value chain (Table 4). The most important aspect of the existing chain is the gradual disappearance of the independent pre-processing sector, which has been an integral part of the seafood value chain. The pre-processing node of the value chain is getting integrated to the processing sector causing a major transformation of the existing value chain. The shift to integrated pre-processing by EU-approved processing facilities led to the closure of a significant number of independent pre-processing operations. At the same time, however, installed capacity has actually increased, reflecting consolidation of the sector.

The major downstream end of the seafood value chain of Kerala, is Europe, wherein European Commission's Directorate-General for health and consumer protection, responsible for ensuring the entry of safe food to the EU, had tightened the stipulated

food safety control system. The EU importers are also under the pressure to ensure the complete safety of the imported food by technically quantifying the low risk range of the product which are sold in the EU market. The proliferation of voluntary private standards in response to the market forces in the EU is another aspect of the stringent food safety regime. The retail chains in the EU member states come up with voluntary private standards which are much stricter than the European Commission's mandatory standards. Way back in 1998, UK retailers in the form of a consortium initiated the formulation of common safety regulations for checking the imported food items, which was known as the British Retail Consortium (BRC). The BRC standard and other private Codes of Practice (COP) and standards, such as EUREP-GAP⁵ and Safe Quality Food (SQF), are now applied by supermarkets and importers all over the world to coordinate supply chain activities and control food safety (Willems *et al.*, 2005).

The overseas respondents had perceived food safety control as one of the highest priorities within the fishery sector. According to them, consumers increasingly are willing to pay premium price for safe products. The labelled or branded products are differentiated from other products. In the case of private labels or brands, retailers are directly responsible for food safety and keep close contact with all actors in the value chain. This has led to a proliferation of sector oriented Codes of Practice (COPs) incorporating a range of standards relating to all the elements that make up the food management chain (growing, processing, handling, etc.) (CTA, 2003). With growth in the number of COPs, there was an associated increase in the power of the large retail chains.

Large supermarkets have consistently expanded their range of products in the recent period to include foods that were previously supplied by small specialist outlets. Consequently, many of these outlets have now vanished, leaving management of the food chain in the hands of large retail chains that fight with each other for market share. Will and Guenther (2007) have observed that eventually perhaps 15 huge retail chains will control 80 per cent of the fresh produce sales to an expanded EU population of 455 million. Such

⁴ The limit of determination (LOD) is the lowest concentration of a pesticide residue that can be measured using routine analysis (<http://www.pesticides.gov.uk/>)

⁵ EurepGAP is a private sector body that sets voluntary standards for the certification of agricultural products around the globe. (<http://www.eurepgap.org>)

concentration of power basically moves the primary decision-making away from the developing country to the importing EU bloc.

An additional consequence of the increased pressure for 'safe' products on EU importers is their growing preference to deal only with large production units in the developing countries. This reduces the level of risk to the importers, as large producers are more able to undertake the compliance measures than small producers are. Unfortunately, for developing countries, this can result in the smaller producer being totally excluded from its major export market. Which has already taken place in the processing node of the Kerala's seafood export value chain. The results from the field study of the upstream value chain apparently support this argument. We have found that few exporters who were well established and updated with the development of food safety standards of the export destination were well prepared and proactively carried out the necessary precautions. In turn, they were benefitted during the crisis by increasing their market share in the export markets. The exporter has little bargaining power and can be subject to pressure from the importers and chain managers to change the production methods, cut labour costs, impose new social standards etc. so that the retailer can maximize the commercial advantage of the relationship.

To sum-up, the present seafood value chain from Kerala can indubitably be put in the bracket of buyer-driven chain or directed network. The concentration at the downstream end of the chain has its ripple effect all along the chain. The most important aspect of the existing chain is the gradual disappearance of the independent pre-processing sector, which has been an important stakeholder of the seafood value chain of Kerala. The pre-processing node of the value chain is getting integrated in the processing sector causing a major transformation in the existing value chain. At the upstream end of the chain, we may observe different types of coordination; varying from arm's length transaction to relational coordination, and even vertical integration.

Conclusions and Policy Implications

This study was initiated with the hypothesis that evolving stringent food safety standards imposed by the developed countries, will, not only affect the export firms alone, but also the entire supply chain will be

transformed accordingly. During the mid-1950s to late-1960s, the US importers effectively intervened in the upstream end of Kerala's fishery sector by providing all possible supports in the aspects of technology, knowledge transfer, and financial facilitation. The nascent stage seafood export industry developed as the capable export sector during this period. There was even vertical integration of upstream end where the processors themselves owned the fishing boats and pre-processing functions were also carried out by the processing units. Nevertheless the fishery sector during that period was exclusively dependent on the US markets. From the early-1970s, Japan emerged as a competing importer of seafood from Kerala. By this time the exporters had developed the competency, and a number of large export houses entered into the business. The switch over cost from the US markets to the Japanese market was very less, and with the increase in supplier competence the value chain coordination also shifted from the captive form to modular type of coordination. The vertical disintegration and division of labour were striking features during 1970s and onwards. Separate pre-processing centres were established and become functional during mid-1970s. A large number of new entrants were attracted to the business until mid-1990s. In the recent food safety regulatory regime, the seafood value chain has been completely restructured. Most striking feature of the present seafood value chain of Kerala is the absence of the earlier dominant pre-processing hubs.

The shift to integrated pre-processing by the EU-approved processing facilities led to the closure of a significant number of independent pre-processing operations. At the same time, however, installed capacity has actually increased, reflecting the consolidation of the sector. These observed changes in the structure and *modus operandi* of export supply chains, *per se*, are not attributable to the imposition of stricter food safety standards alone. Rather, the challenges of compliance with these standards, acted to exacerbate existing competitive pressures that in turn reflected prevailing market and economic conditions. The study has demonstrated the possible sectoral impact of the international policy changes like that of stringency in the food safety regulations on the developing countries. In the present case of the seafood value chain from India, a complete transformation of the value chain is clearly visible. From the long-term policy perspective, India should upgrade the national

system for testing, certification and laboratory accreditation so as to be at par with the prevailing international trade regulatory safety parameters. In this regard, it is also important to focus on proactive capacity building activities in the entire seafood value chain of the country.

Acknowledgement

The authors are grateful to the reviewer's valuable comments that helped to significantly improve the manuscript.

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